

Sentinel Visualizer®

Advanced Data Visualization and Analysis

Sentinel Visualizer provides a powerful new generation of visualization and analysis capabilities. With a wide variety of tools, Sentinel Visualizer allows you to find new insight, patterns, and trends hidden in existing data leading to accurate and actionable intelligence.

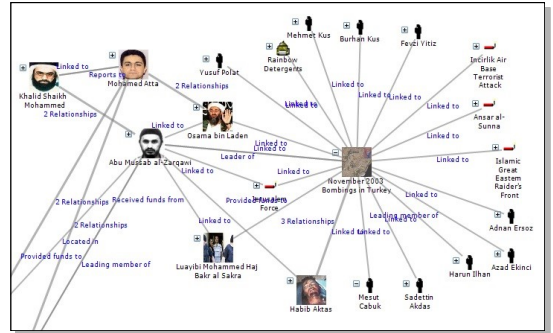
Data Visualization

With Sentinel Visualizer visualization tools you can:

- Organize complex networks
- Find hidden relationships and shortest paths
- Quickly identify clusters and patterns
- Perform ad-hoc analysis

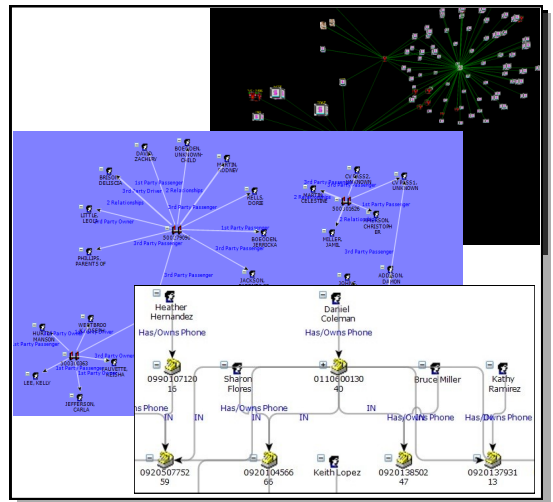
Advanced Link Analysis Charts

Sentinel Visualizer provides 2D and 3D network link analysis. Automatically build network charts with complete control over layout and appearance. Query the knowledgebase for entities and relationships, and the system automatically organizes the data into a coherent and visually clear network. Set styles to control the appearance of images, colors, fonts, and line styles. Easily pan, zoom, and perform ad-hoc data analysis.



Direct Knowledgebase Integration

Since the visualization surfaces are connected to your database, you have immediate access to comprehensive information about any object in the network with multiuser sharing. Click on an entity and display all its narrative, metadata and linked content. The Details pane provides quick access to the key data points for entities and relationships.



Automated Analysis

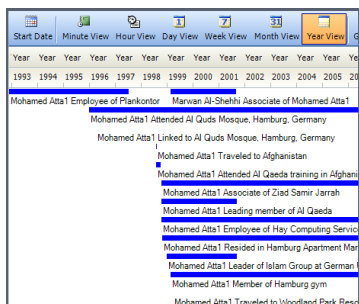
With Sentinel Visualizer Automated Analysis you can:

- Automatically identify central players
- Use Social Network Analysis (SNA)

Network Metrics

Sentinel Visualizer includes Network Metrics—our advanced technology for identifying, grouping, and ranking complex inter-related data. With a foundation in Social Network Analysis, our system provides the ability to rank centrality, importance, and other key metrics even within large complex datasets so you can identify hidden relationships.

Name	Type	Degree	Betweenness	Closeness	Eigenvalue	Hub	Authority
Osama bin Laden	Person	44	1	1	0.7071	0	0.7071
Abdallah Al-Halabi	Person	1	0	0.560606...	0.0049	0	0
Abu Mussaab al-Zarqawi	Person	3	0	0.632478...	0.0049	0.7071	0
Al Qaeda	Terrorist Organiz...	1	0	0.560606...	0.1254	0	0.2887
Ayman Al-Zawahiri	Person	1	0	0.560606...	0.0049	0	0
Enaam Arnaout	Person	1	0	0.560606...	0.0049	0	0
Imad Eddin Barakat Yarbas	Person	1	0	0.560606...	0.0049	0	0



Temporal Analysis

Sentinel Visualizer provides a powerful Time Range interface that hides or shows data based on a time slider control. Temporal Analysis makes it easy to see how networks form, change, and interact with each other over time. This capability allows you to spot patterns and predict actions and behaviors.



Flexible Data Access

The Sentinel Visualizer Knowledgebase makes it easy to store and manage any type of data. Manage people, places, organizations, email addresses—virtually any data type. You can also add your own metadata types to the system for complete flexibility. Search options make it easy to find the data you need.

Data Management and Search

Sentinel Visualizer makes it easy for your entire team:

- Organize and store a rich array of data types
- Import data from a variety of data sources
- Name disambiguation and advanced search features
- Find text inside embedded documents like Word, Excel, PDF, text, etc.
- Save and combine searches to find common entities across locations and time

Geospatial Analysis

With Sentinel Geospatial Tools you can:

- Visualize entities and relationships on a map
- Use online maps and zoom to any part of the world
- Support offline maps and ESRI shape files
- Perform geo-query operations to find data by region
- Filter visualization data by area
- Store and manage geospatial data

Reports and Sharing

The system is multi-user capable and allows you to build reports and presentations. Data sharing is automatic—users have access to information through a secure logon environment. Track changes by users, and make personal copies of analysis and visualization data.

Sharing data with non-Sentinel users is also easy. A free Sentinel Visualizer Reader Edition is available to distribute your work. You can also export data in a variety of formats, including Microsoft Word, Excel, PDF and web pages.

System Specifications

Open Database Standards

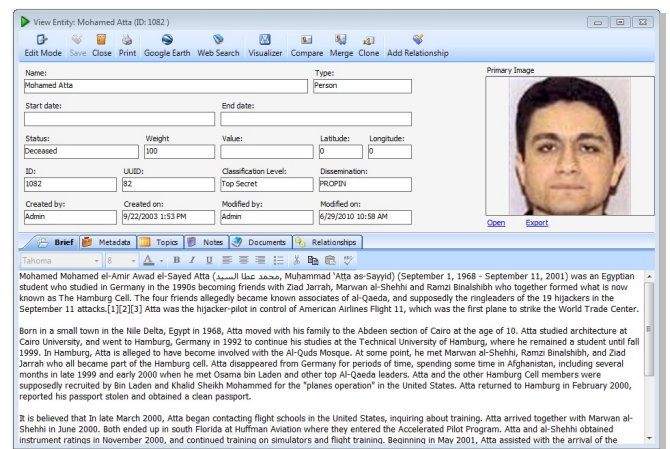
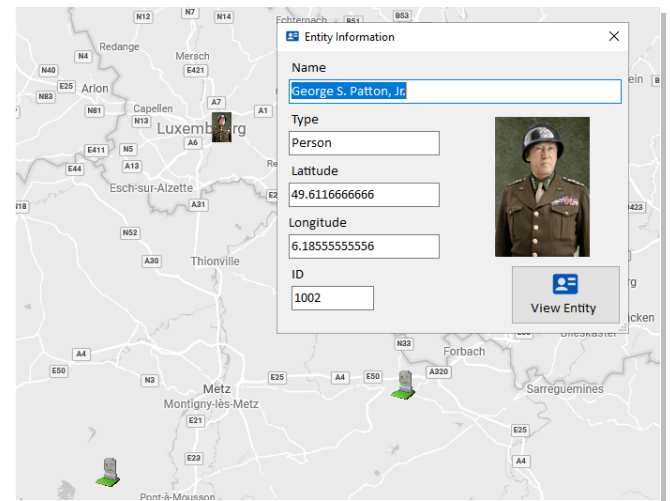
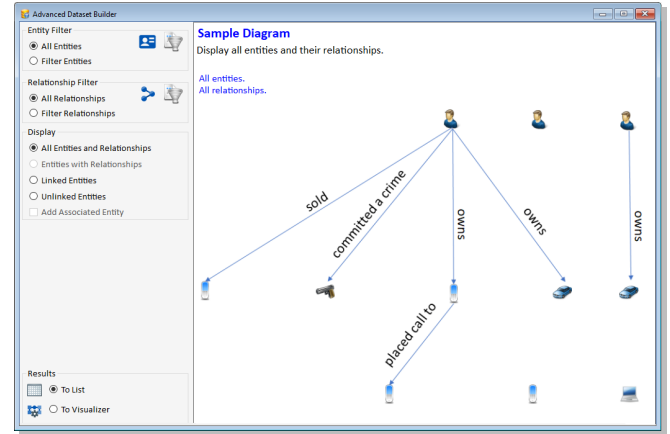
Sentinel Visualizer stores its data in Microsoft SQL. This open architecture ensures you can always get to your data, conforms to your security standards, and can be combined with other sources. Data, graphics, videos and other documents can be stored internally or as links to their sources.

Support Connected and Disconnected Environments

Sentinel Visualizer stores its data in Microsoft SQL Server which can be located locally, on a shared network server, and in the cloud such as SQL Azure. Run Sentinel Visualizer on a network or disconnected mode on a standard laptop with a local database when analysis is needed in the field.

Get Started Today

- Visit fmsasg.com for product information, whitepapers, product tour, and customer testimonials
- Contact us for a free evaluation copy



Sentinel Visualizer[®]

Analysis

All data has hidden meanings, patterns, and trends, but identifying them is a challenge that only advanced automated analysis can address. Sentinel Visualizer offers some of the most sophisticated analytic capabilities available. With Sentinel Visualizer automated Analysis you can:

- Automatically identify central players
- Locate organizational cut-points
- Perform timeline analysis
- Organize data relationships into cells and cliques
- Include your own metadata in the analysis process
- Find all paths, the shortest path, or the best paths between two entities
- Build simple or complex models that mirror your needs

Network Metrics

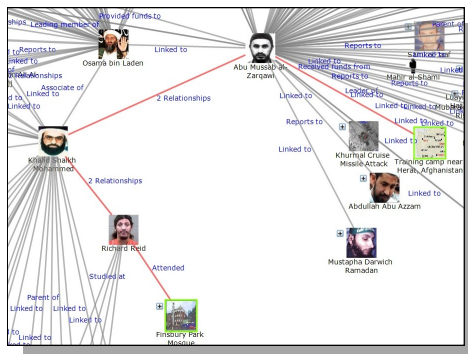
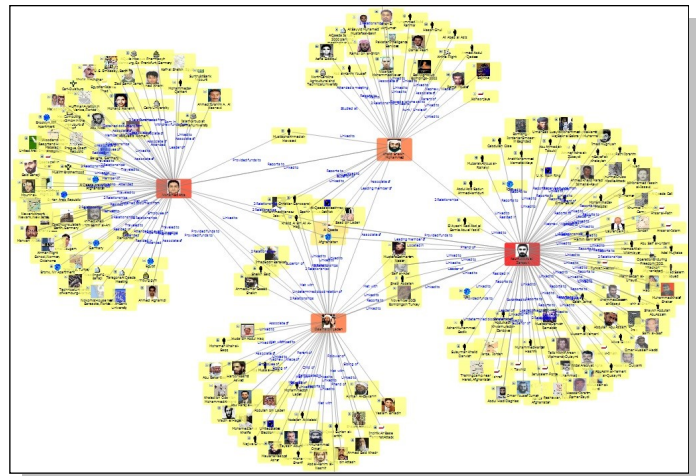
Sentinel Visualizer includes Network Metrics—our advanced technology for identifying, grouping, and ranking complex inter-related data. With a foundation in Social Network Analysis (SNA), our system provides the ability to rank centrality, closeness, and other key metrics even within large complex datasets.

But unlike other SNA-based systems, Network Metrics extends the analysis model by assigning specific meaning and weighting that models your data and mission.

Name	Type	Degree	Betweenness	Closeness	Eigenvalue	Hub	Authority
Osama bin Laden	Person	44	1	1	0.7071	0	0.7071
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The Big Picture

Network Metrics are generated as a set of sortable numbers so you can quickly see central and highly connected players in a network. Sentinel Visualizer takes this capability to the next level with Gradient Metrics so you can automatically apply numeric rankings to the visual appearance of the network. Specify colors for high and low values, and Sentinel Visualizer does the rest. This feature makes it easy to visually acquire meaning in even the most complex inter-related data.



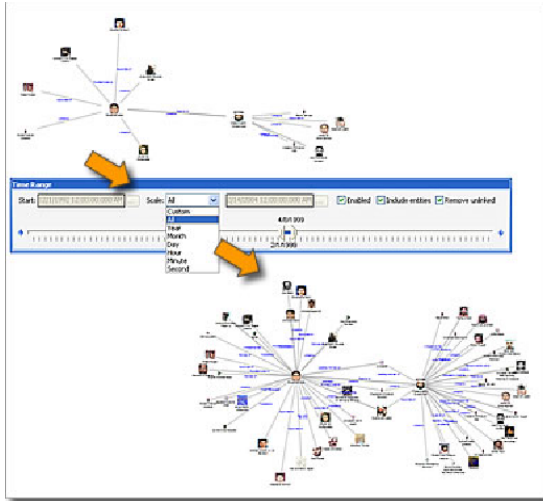
Finding Paths

How are things connected? What connection paths do people work through? What is the shortest or best path between two data elements? Sentinel Visualizer provides a variety of tools that make it easy for you to answer such questions. With highly optimized graph algorithms, you can quickly see all paths, the shortest path, or only the best paths between entities based on your specific criteria.

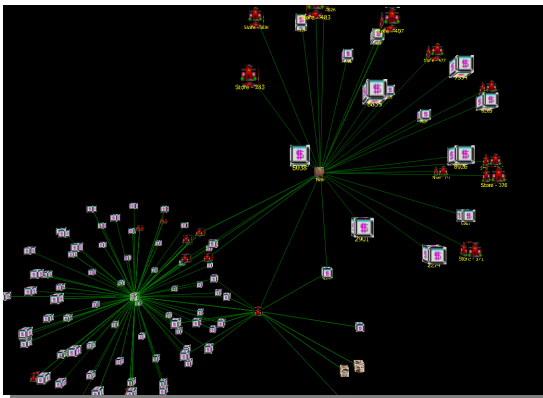
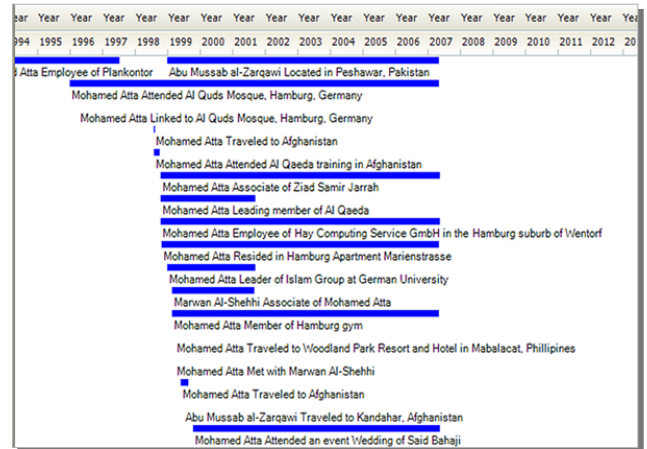


Temporal Analysis

Sentinel Visualizer provides a powerful Time Range interface that hides or shows data based on a time slider control. Temporal Analysis makes it easy to see how networks form, change, and interact with each other over time. This capability allows you to spot patterns and predict actions and behaviors. The Time Range interface supports ranges down to the second level, and includes the ability to visually define time spans and ranges.

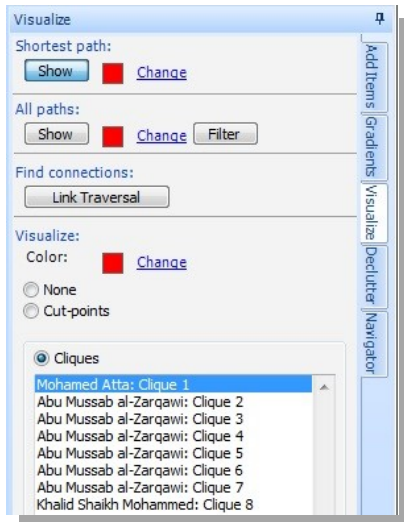


Additionally, you can use the Timeline View to quickly see events in a linear time format.



Granular Control and Tuning

All information is not equal, just as all objects and all links between objects are not equal. While traditional link analysis fails to take this into account, Sentinel Visualizer Automated Analysis provides you with unprecedented accuracy through weighting. Sentinel Visualizer gives you the ability to accurately model simple or complex systems by specifying the weight of entity and relationship types, information credibility, and a variety of other parameters.



Key Nodes, Cliques, and Cells

By analyzing the results of network statistics, Sentinel Visualizer provides tools that help you find meaning in your data. Sentinel Visualizer pinpoints and provides a visual representation of cliques: groups of entities within a network that are closely connected to each other.

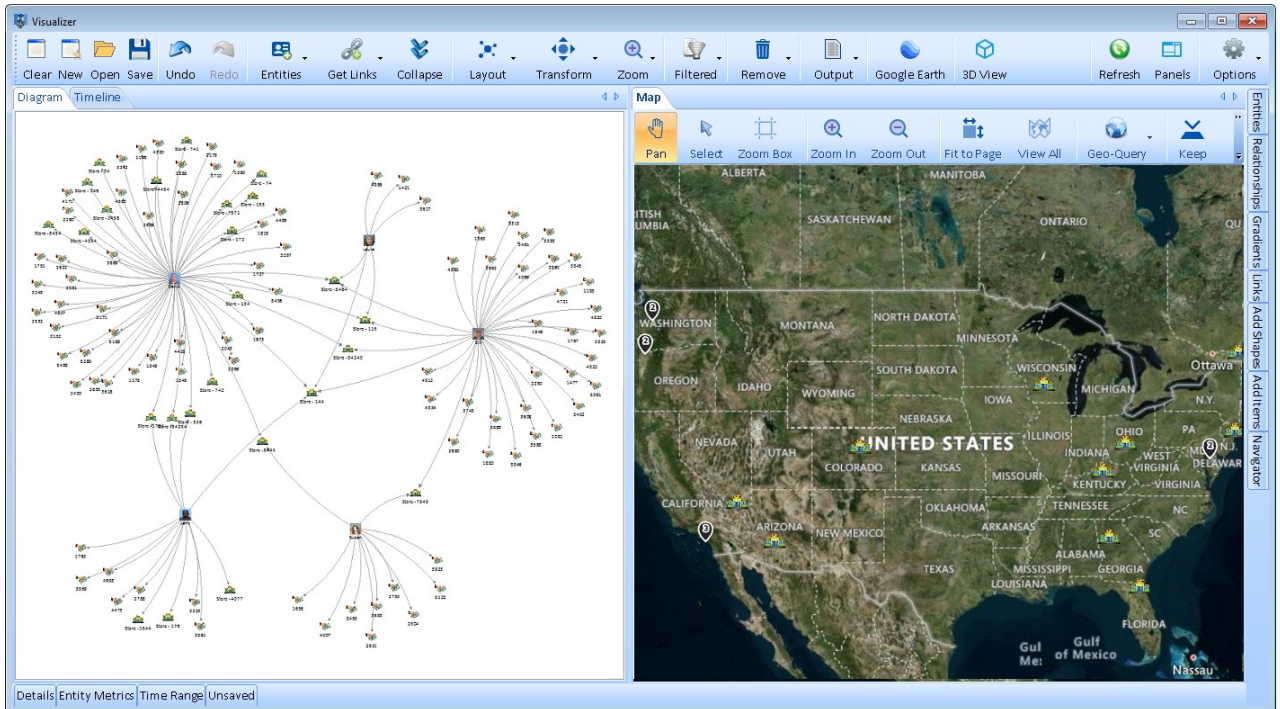
Sentinel Visualizer also locates and displays cut-points, or entities whose removal can seriously disrupt or destroy the link between sub-groups. This may help your prioritize areas of interest to devote your resources.



Sentinel Visualizer®

Geospatial Analysis

When you add entities with latitude and longitude to the diagram, they are also added to the Map pane. Sentinel Visualizer supports online and offline maps by placing icons and images of your entities. With an Internet connection, Microsoft Bing Maps let you zoom into detailed global maps. You can also export data directly to Google Earth on your PC. Offline maps support layers with Shape files, ESRI ArcGIS, GeoTIFF, and other providers.

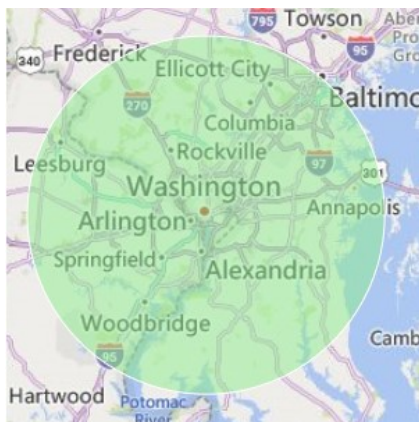


See Your Entities on a Map

Easily see the geographical location of your entities to adds a whole new way to understand your data. See individual icons and groupings if several are close to each other until you zoom in.

Geo Query and Selection

Draw a circle or rectangle on the map to add all the entities located there. Select the entities in an area, then keep or remove them.



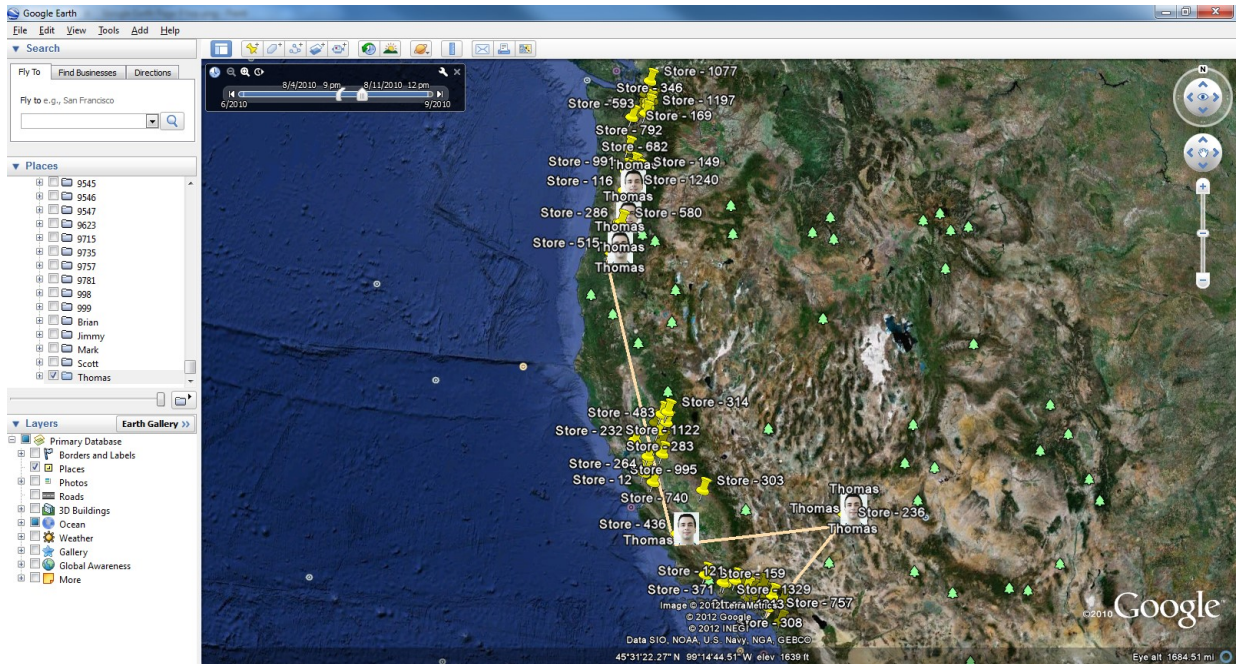
Complete Control

The Map toolbar offers powerful tools to manage the map with your data. The Zoom Box adjusts the map to the rectangular area you draw. Fit to Page adjusts the map to include all your entity locations.

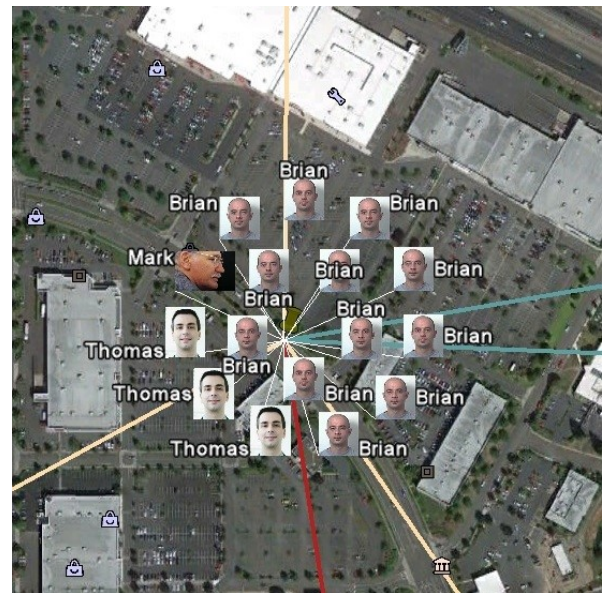
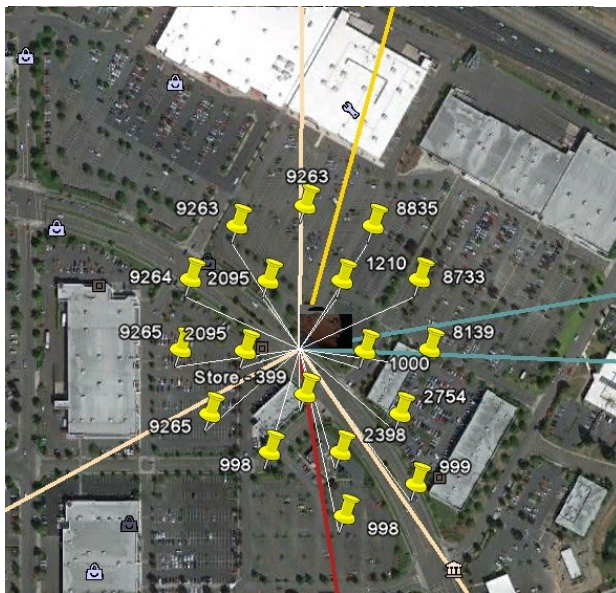


Integration with Google Earth

Send your dataset to Google Earth (free). If your data includes date information, you can also use Google Earth's timeline feature to animate your network over time. Below, the lines indicate the person's travels across locations and time.



Zoom in to drill-down to details about that location. Below, for example, we can see transactions (left) that occurred at a particular location or the actual people (right) that performed those transactions at that location.



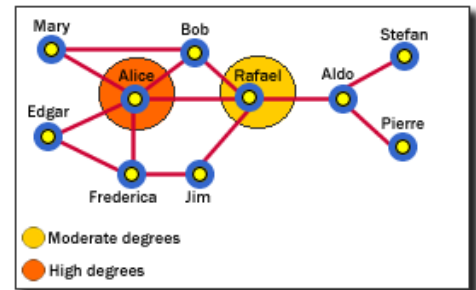
Introduction to Social Network Analysis

Sentinel Visualizer provides you with automatic analysis, providing definition and meaning in any network, simple or complex. The heart of the analysis is the application of Social Network Analysis, SNA, as a set of tools to identify centrality. SNA provides a set of methodologies and formulas for calculating a variety of criteria that map and measure the links between things.

Degree Centrality

Degree centrality is simply the number of direct relationships that an entity has. An entity with high degree of centrality:

- Is generally an active player in the network.
- Is often a connector or hub in the network.
- Is not necessarily the most connected entity in the network (an entity may have a large number of relationships, the majority of which point to low-level entities).
- May be in an advantaged position in the network.
- May have alternative avenues to satisfy organizational needs, and consequently may be less dependent on other individuals.
- Can often be identified as third parties or deal makers.

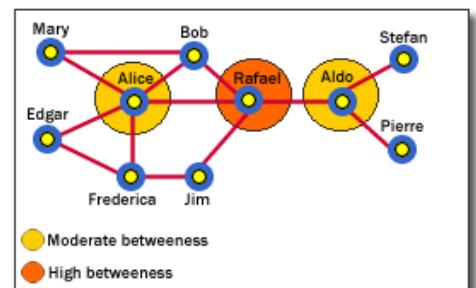


In our example network diagram (represented by the colors as noted on the key), Alice has the highest degree centrality, which means that she is quite active in the network. However she is not necessarily the most powerful person because she is only directly connected within one degree to people in her clique—she has to go through Rafael to get to other cliques.

Betweenness Centrality

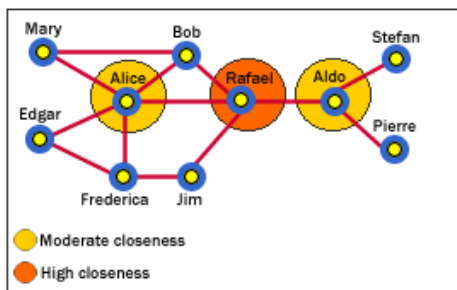
Betweenness centrality identifies an entity's position within a network by its ability to make connections to other pairs or groups in a network. An entity with a high degree of betweenness centrality generally:

- Holds a favored or powerful position in the network.
- Has a greater amount of influence over what happens in a network.
- Represents a single point of failure—take the single betweenness spanner out of a network and you sever ties between cliques.



In this example, Rafael has the highest betweenness because he is between Alice and Aldo, who are between other entities. Alice and Aldo have lower betweenness because they are only within their own cliques. So although Alice has a higher degree centrality, Rafael may have more importance in the network.

Closeness



Closeness centrality measures how quickly an entity can access more entities in a network. An entity with a high closeness centrality generally:

- Has quick access to other entities in a network.
- Has a short path to other entities.
- Has high visibility as to what is happening in the network.

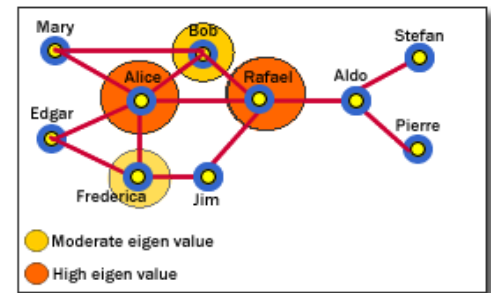
As with the betweenness example, Rafael has the highest closeness centrality because he can reach more entities through shorter paths. As such, Rafael's placement allows him to connect to entities in his own clique, and to entities that span cliques.

Eigenvalue

Eigenvalue measures how close an entity is to other highly close entities within a network. In other words, Eigenvalue identifies the most central entities in terms of the global or overall makeup of the network. A high Eigenvalue:

- Indicates an actor that is more central to the main pattern of distances among all entities.
- Is a reasonable measure of one aspect of centrality in terms of positional advantage.

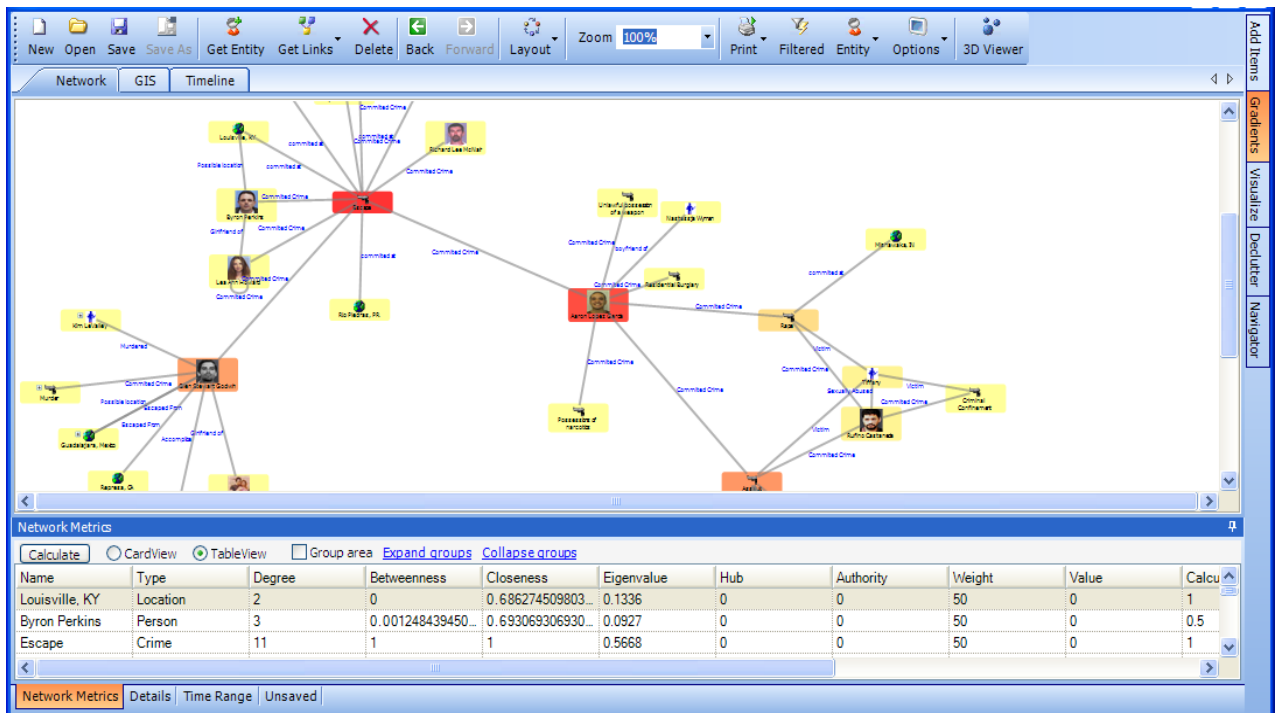
In this example, we can see that Alice and Rafael are closer to other highly close entities in the network. Bob and Frederica are also highly close, but to a lesser value.



Putting Social Network Analysis to Work

Sentinel Visualizer uses Social Network Analysis to automatically identify key nodes and groups within your data. In addition to the metrics already listed, it provides valuable data on other aspects such as hubs and authorities, entity and relationship weight, entity types and statuses, and various other parameters. The result is highly accurate analysis that reveals the hidden patterns and trends in your data.

SNA is directly integrated into the visualization form and is as simple to access as pressing a button. Once Sentinel



Visualizer has generated SNA numbers for your data, you can easily sort by any of the values, and color code them directly on the network view.

The application of Social Network Analysis is just one of the many ways Sentinel Visualizer truly defines the next generation in analytical software.



Sentinel Visualizer®

Free Reader Edition for Sentinel Visualizer

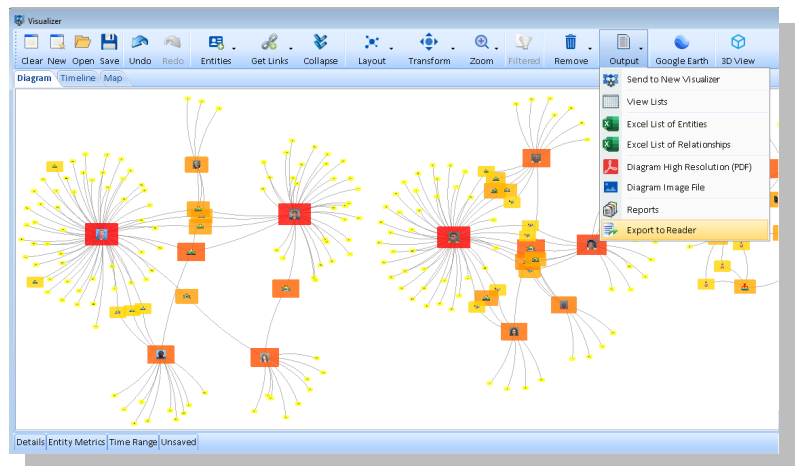
The Sentinel Visualizer **Reader Edition** is a FREE companion to Sentinel Visualizer. Create your link charts and distribute them to others. With the free **Reader**, your colleagues can view your data visualizations and drill down into details without being connected to your database. This includes your entity metadata, notes, topics, documents, and information on the Brief tab.

Easily export a file with your link chart and data to share with non-Sentinel Visualizer owners. The **Reader** lets them:

- View and navigate your network visualization chart including gradient metrics, filters and custom labels and shapes
- Click on individual entities and view its details
- Click on lines and see its relationships
- Display the details of relationships
- Zoom in and out
- Move objects around the link chart
- Visualize the network in 3-D
- Send the diagram to printer and file

How Does it Work?

From the Visualizer, choose Export to Reader, name the file, then distribute the SVX file. The file is a "mini-database" with the visual link chart plus details on each entity and relationship. Just like Adobe Reader® is free and opens PDF files, Sentinel Reader is free and allows you to open an SVX file not connected to your database.

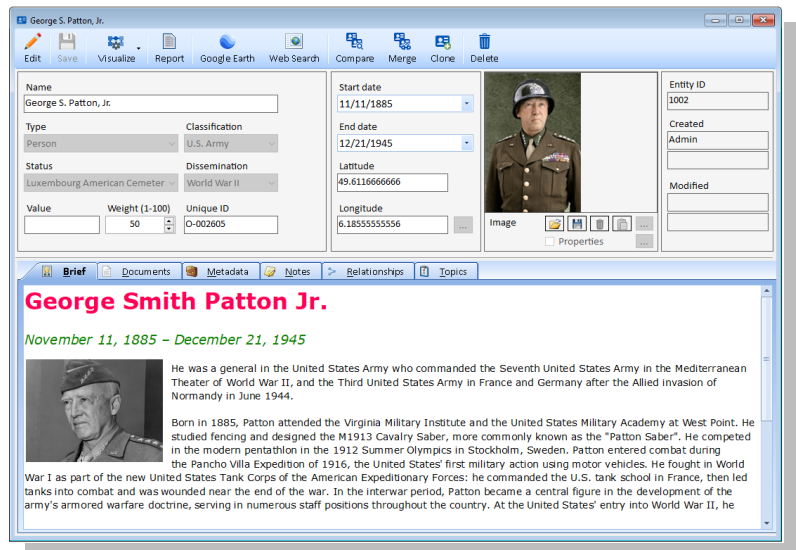


Entity and Relationship Details

Just like the fully-licensed version of Sentinel Visualizer, the **Reader** lets you open an Entity's details to display its information from the shared database. This includes its picture, lookup values, dates, brief, documents, metadata, notes, and list of relationships to other entities.

Limitations

The free **Reader Edition** is a read-only version for use with saved network diagrams. It does not allow the user to modify the data or diagram by adding new entities or relationships. Analytic features are not available ... so the **Reader** does not support applying additional layouts, color gradients, path and clique analysis, data filtering, and decluttering. The **Reader** can manipulate the diagram by moving entities around and printing them, but the changes cannot be saved.





About the FMS Advanced Systems Group

The FMS Advanced Systems Group (ASG) is a division of FMS, Inc. FMS is an award-winning, small business delivering proven database and analytic software to a wide range of customers for 37 years.

FMS's products and applications are widely used by 90 of the Fortune 100 companies, within every US Federal Government department, and organizations in over 100 countries.

ASG has a rich history of proven solutions to complex data and analysis problems. From Bayesian theory to Social Network Analysis to Temporal Analysis and Geospatial Visualization, we adapt cutting-edge technologies to solve complex problems. These solutions bridge the gap between technology and usability in innovative ways. The results-driven approach embraced by ASG enables clients to use their data in a collaborative environment that improves operational efficiency.

FMS is an In-Q-Tel portfolio company, a Microsoft Certified Partner, and was named to the Software Development Times list of the World's Top 100 Software Innovators and Leaders.



Learn More...

To learn more about us or Sentinel Visualizer, please visit fmsasg.com, email us at info@fmsasg.com, or call 703-356-4700.



Advanced Security Feature

The Advanced Security add-on (additional fee, over-and-above the basic licensing fee) for Sentinel Visualizer allows a System Administrator to define Users and Groups and control their read, edit, and delete permissions at a granular level. Topics can be defined to provide a great degree of control over what Users can view and do with the data.

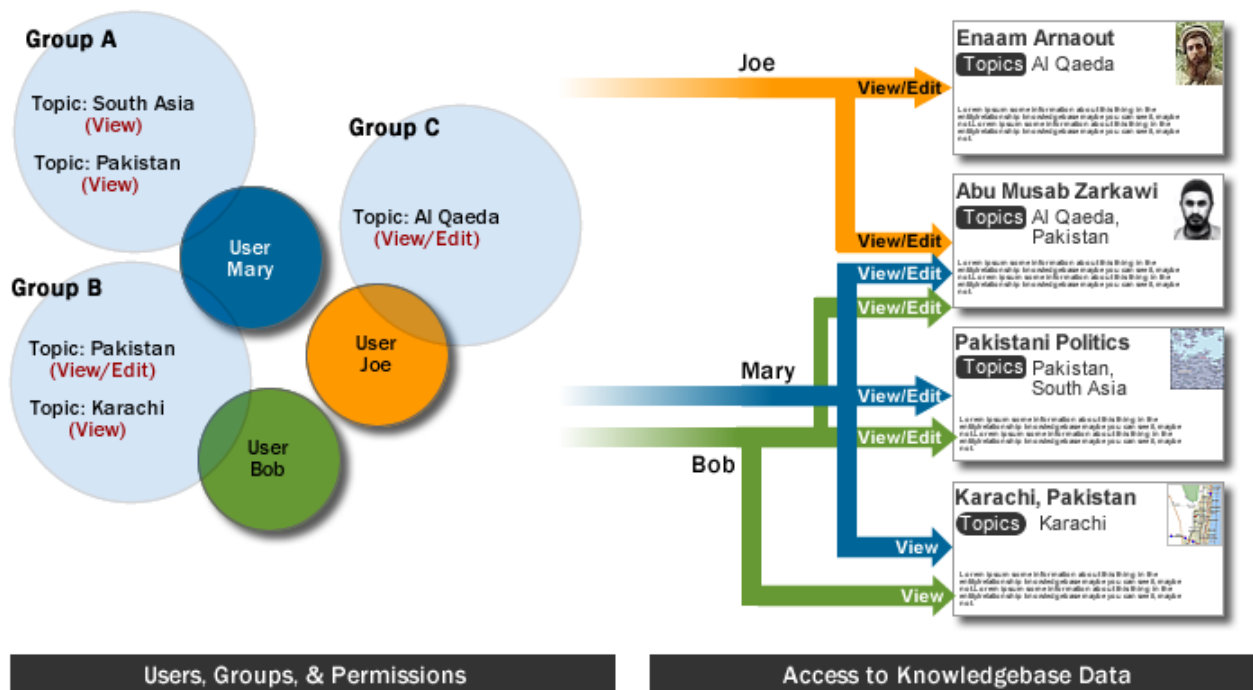
Users and Groups

The cornerstone of the Advanced Security Feature is the concept of Users and Groups. A User is an account that you define to allow a specific person to gain access to the Sentinel Visualizer database. A Group is a collection of User accounts to simplify the management of User rights.

Permissions

An Administrator assigns View and Edit permissions based on Topics. Data is assigned to Topics and user access is determined by whether the user/group has rights to the topic. Permissions may also be granted to Users for retrieving saved **network visualizations** (diagrams).

In this illustration, there are three groups: A, B and C, and three users: Mary, Joe and Bob. Mary is a member of two groups and



these two groups are assigned to several topics. So, Mary can View and Edit the “Abu Musab Zarkawi” and “Pakistani Politics” entities but can only view the “Karachi, Pakistan” topic. Put simply: Users belong to Groups; Groups are associated with Topics, Permissions are set at the Group/Topic level; Data records have one or more Topics.

Distributing Network Diagrams

The Advanced Security feature allows diagrams (network visualizations) to be defined as:

- **Public:** viewable by anyone — including *Reader* Users — who has access to the Sentinel Visualizer database
- **Private:** viewable only by the User who created the diagram
- **Granular:** viewable by only the Users/Groups assigned with those permissions

Hardware and Software Requirements

Sentinel Visualizer is compatible with the following operating systems:


- Microsoft Windows Vista, 7, and 8
- Microsoft Windows XP, Service Pack 2 or later

For multi-user configurations, Sentinel Visualizer supports:

- Microsoft SQL Server 2000, 2005, 2008, and 2012

The Sentinel Visualizer software is installed on a computer's local hard drive. Sentinel Visualizer's Microsoft SQL *database* can reside on the computer's local hard drive (for use "in the field") or on a network server (for multi-user collaboration). On the local hard drive as a single-user system, the Sentinel Visualizer software uses Microsoft SQL Express. On a shared network drive, you would provide the appropriate Microsoft SQL Server licenses.

This table lists the minimum and ideal hardware configurations. The overall rule, however, is to install the most powerful equipment that you can afford:

Feature	Minimum	Ideal
CPU	2 GHz 32-bit (x86) dual core processor	64-bit (x64) Intel i5 or higher
RAM	4 GB	8 GB or more
Monitors	One	Multiple monitors
Resolution	1280 x 720	Highest resolution your monitor supports
Video Card	For 3-D features, DirectX 9 graphics and 32 MB of graphics memory	Support for DirectX 9 graphics with 512 MB of graphics memory
Hard Disk	1 GB, plus space for your database if stored locally	1 GB, plus space for your database if stored locally; SSD (Solid State Drive) for hosting SQL Server and other disk intensive processes
Microsoft SQL Server	None for single-user features. SQL Express is installed on your desktop for your data.	A shared SQL Server database for multi-user features (you need to have your own SQL Server license for this)
Internet Connectivity	For concurrent licenses, an continuous connection is required.	High-speed internet connectivity for open-source web search and Google Earth support
Optional 3D glasses for stereoscopic visualization	 Anaglyph 3D Glasses	

Is a dongle or other form of hardware lock required?

No. Unlike other link analysis vendors, we believe that forcing users to maintain and use a hardware lock (dongle) is a practice that considers customers as criminals. Sentinel Visualizer does not require any type of hardware or dongle device.